FASCINATING BUTTERFLIES WITH TRANSPARENT WINGS

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Butterflies are one of a lot of varied as well as attractive insects worldwide and are viewed as brightly coloured, day-active and harmless insects reflecting tranquility and harmony. The beauty of each butterfly lies in its wings, in their various colors.

Figure 1 – Stationery card of Costa Rica 1999 with glasswing butterfly *Greta oto*

In the tropical forests of South America there are the butterflies that have lost their scaly covering, and their wings are almost completely transparent. When such a butterfly is on the crown of a tree, it is quite unnoticeable because the design of a leaf on which it sits appears through its glassy wings (Figure 1).

Clear-winged butterflies, also called glasswing butterflies, live mostly in Central America and South America. They look like other butterflies in every way except one: Instead of sporting brilliant color displays, they have wings you can see through. Their wings are shaped like those of other butterfly species, but clear-winged butterflies lack the tiny scales necessary to create color. The overlapping scales provide multicolor displays on the wings of many butterflies, but the clear-winged variety has only a few concentrated around the outer edges, often in brown or orange. Veins appear like webs throughout the wings, but these don't add much color -- they typically look brown.

The butterfly with scientific name *Greta oto* (Figure 2) is known by the common name glasswing butterfly for its unique transparent wings that allow it to camouflage without extensive coloration. The butterfly is mainly found in Central and northern regions of South America with sightings as far north as Texas and as far south as Chile. While its wings appear delicate, the butterfly is able to carry up to 40 times its own weight. In addition to its unique wing physiology, the butterfly is known for behaviors such as long migrations and the ability to fly up to eight miles per hour for short periods of time. The transparent wings help the butterfly blend in with the environment to avoid predators while in flight and while at rest. In order for its wings to be transparent, the tissues of the wings must not absorb light. The irregular structure of the butterfly wing causes little to no reflection of light, causing the glass-like effect on the wings of the butterfly. This irregular structure has even been a source of biomimicry to create anti-reflective coatings for technology. Engineers are copying the butterfly's wing to create surfaces that sieve light with exquisite precision.

Figure 2 – Stamp of Romania 2011, Scott #5249, with tab and butterfly *Greta oto*

The clear tissue that makes up the wings (Figure 3) does not contain the colour-producing scales present in most butterfly wings. As a result, the tissue does not absorb or scatter much light, instead letting most of it pass through. Not much light is reflected, either, due to microscopic structures on the surface called 'nanopillars'. The nanopillars have a random distribution of sizes and positions, which means that there is a gradual transition between the refractive index of the wing and that of the surrounding air. This

Figure 3 – Souvenir sheet of Nicaragua 1991, Scott #1870, with glasswing butterfly *Ithomia derasa*

ensures very low reflection over a wide range of wavelengths. The end result is that the wings appear optically transparent.

The look of these beautiful glasswing butterflies fluttering their transparent wings has brought inspiration to engineers studying biomimetics, especially in optics. In the case of glasswing butterflies, scientists focus on the irregular nanostructure of their wings which gives them this ability to let light pass through (Figure 4). For example, German engineers from the Karlsruhe Institute of Technology have been studying glasswing butterflies to solve issues involved in screen glare. The team seeks to develop a perfect anti-glare display for laptops, smartphones, and other devices. This, however, is not the only biomimetic study that glasswing butterflies have inspired. The most recent development in glasswing butterfly biomimicry comes from the California Institute of Technology. Engineers took the antireflective property of the wings of longtail glasswing butterflies with scientific name *Chorinea faunus* (Figure 5) as a model to develop an ultrathin eye implant to monitor intra-eye pressure. With Caltech's biophotonic eye implant, which comes with a handheld reader device, glaucoma patients can monitor the pressure inside their eyes constantly at home, and take medications if there's a spike. Also known as the Glasswing Swallowtail, this butterfly is found in the more North-Eastern countries of South America. The wings of this butterfly are mostly transparent with bright red tails - beautiful and delicate long tailed glasswing swallowtail.

Figure 4 - Stamp of Grenada-Grenadines 2019 with glasswing butterfly *Pteronymia cotyttot*

Figure 5 – Stamp of Grenada-Grenadines 1991, Scott #1285, with butterfly *Chorinea faunus*

A similar butterfly *Chorinea licursis* species can be found in the forests of Brazil (Figure 6). *Chorinea licursis* has a wingspan reaching about 30–35 millimetres. These butterflies are quite variable with respect to the size of the transparent region and of spots on the hindwings. They have transparent wings outlined with black and long tails on the hindwings. Forewings and hindwings are crossed by black veins and by two black transverse bands. At the base of the hindwing tails there are bright red marks.

Figure 6 – Stamp of Brazil 2016, Scott #3347o, with butterfly *Chorinea licursis*

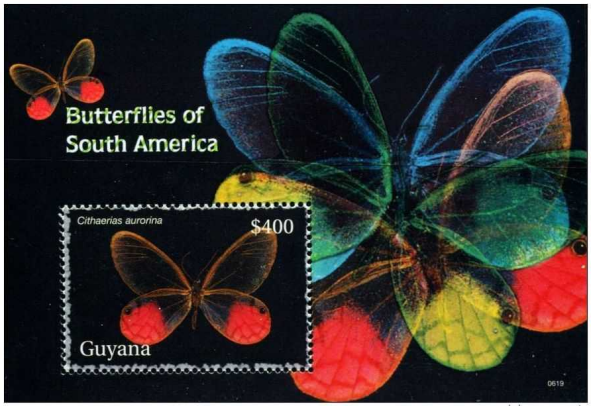

Figure 7 – Souvenir sheet of Guyana 2007, Scott #3965, with butterfly *Cithaerias aurorina*

In fact, there are many dazzling species with transparent wings. For example, this the Pink Glasswing Butterfly, sometimes known as the Blushing Phantom. This transparent butterfly with scientific name *Cithaerias aurorina* (Figure 7) simply cannot be photographed. The

effect in real life is of glowing pink matter floating through the dark jungle, one of the great sites of the rainforest to behold.

In the Brazilian jungles butterflies *Cithaerias aurora* species emerge in a variety of ornamental colors. Normally their transparent wings are beautifully colored with eye-like spots ringed with several circles and a reddish flush on the hindwings. Although they are colorful, these wings are weak. Rather than flying with their thin wings, they flit and dance among the herbage, often hiding from their enemies in tall grass and trees (Figure 8).

Figure 8 – Stamp of Brazil 1979, Scott #1620, with butterfly *Cithaerias aurora*

One special species of glasswing butterfly *Cithaerias merolina* out there has a special "blush" look to it (Figure 9). The pink glasswing butterfly – which can be found in the Amazon region – has clear wings at the top, which turn pinkish towards the bottom, making for a butterfly with matching blushing wings. A stunning clearwing butterfly from the undergrowth of a rainforest. Clear wings transition into pink at the tip of the hindwing. A small eyespot is found in the pink shading.

Figure 9 – Stamp of Grenada 2005, Scott #3491c, with butterfly *Cithaerias merolina*

One of the greatest treasures of tropical forest in South America is *Cithaerias esmeralda*, a butterfly whose wings are transparent except for a bright violet patch on the hind wing (Figure 10). This dusk-flying butterfly with wingspan about 5 centimeters uses its wings to remain hidden, tricking observers with false eyes, or hiding in flight on see-through wings.

Figure 10 – Stamp of Grenada-Grenadines 2000, Scott #2195d, with butterfly *Cithaerias esmeralda*

Glasswing butterflies are widespread throughout much of Central America and South America inhabiting the lowland rain forests. One such stunning butterfly species is *Haetera piera*. The butterfly is known as the amber phantom, with light yellow in the bottom wing (Figure 11). These butterflies can be recognized by their largely transparent wings with delicate colors and two bold ocellion the outer margin of the hindwings. Butterflies glide through the understory along the forest floor, and it is during flight that the hind wing colors are most conspicuous. This butterfly thrives in the tropical conditions of the rainforests.

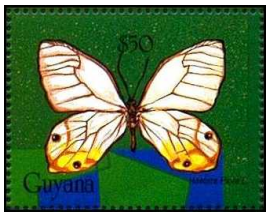

Figure 11 – Stamp of Guyana 1994, Scott #2827d, with butterfly *Haetera piera*

Butterflies attract by virtue of their remarkable appearance, but, among other things, they also play an important role in natural ecosystems, serving as pollinators of many species of flowering plants. The delicacy of their finely patterned wings, some of which are painted in vivid colours, their energetic behaviour and conspicuous presence in our gardens and nature reserves all contribute to our fascination with them (Figure 12).

Figure 12 – Stationery card of Cuba 2012 with glasswing butterfly *Greta cubana*

The Author is ready to help for philatelists in creating of philatelic exhibits on butterflies and moths. His address: Vladimir Kachan, street Kulibina 9-49, Minsk-52, BY-220052, Republic of Belarus, E-mail: vladimirkachan@mail.ru